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Work Plan

October 5, 2009

Prepared for:
Gallagher & Kennedy, P.A.

Roosevelt Irrigation District Early Response Action

West Van Buren Water Quality Assurance Revolving Fund Site

DRAFT

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SUPERINTENDENT

October 5, 2009

Julie Riemenschneider, Manager
Remedial Projects Section
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
1110 West Washington Street
Phoenix, AZ 85007

Re: PROPOSED ROOSEVELT IRRIGATION DISTRICT EARLY RESPONSE ACTION

Dear Ms. Riemenschneider:

On behalf of the Roosevelt Irrigation District (RID) and its Board of Directors, I am submitting two copies of the following document for the Arizona Department of Environmental Quality (ADEQ) review and approval:

ROOSEVELT IRRIGATION DISTRICT
EARLY RESPONSE ACTION WORK PLAN
WEST VAN BUREN WATER QUALITY ASSURANCE REVOLVING FUND SITE

As indicated in the RID Groundwater Response Action Implementation Plan submitted to ADEQ on September 24, 2009, this Work Plan is submitted to document the proposed Early Response Action that RID intends to take to address extensive groundwater contamination in the West Van Buren Area (WVBA) WQARF Registry Site and its impact on RID's wells, operation, and water supply. As the largest groundwater provider in the WVBA Site, this Early Response Action is proposed in accordance with A.A.C. R18-16-405 to mitigate the widespread impacts of the groundwater contamination on RID, alleviate the loss or impairment to RID's water supply, and protect public health and the environment.

We very much appreciate ADEQ review of this Work Plan and look forward to the opportunity to answer any questions or respond to comments you may have.

Very truly yours,

Stanley H. Ashby

Stanley H. Ashby

Cc: Clancy Tenley, Environmental Protection Agency Region 9
David P. Kimball, III Esq., Gallagher & Kennedy, P.A.
Sheryl Sweeney, Esq., Ryley Carlock & Applewhite
Dennis Shirley, Montgomery & Associates

MONTGOMERY
& ASSOCIATES

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ROOSEVELT IRRIGATION DISTRICT
EARLY RESPONSE ACTION WORK PLAN
WEST VAN BUREN WATER QUALITY ASSURANCE REVOLVING FUND SITE

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& ASSOCIATES

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INTRODUCTION

This Work Plan provides the rationale for and outlines the tasks associated with an **Early Response Action (ERA)** to begin mitigation of the widespread groundwater contamination in the West Van Buren Area (WVBA) Water Quality Assurance Revolving Fund (WQARF) site (the WVBA Site). Specifically, the proposed ERA is designed to begin mitigation of the impact of the groundwater contamination on the Roosevelt Irrigation District (RID) production wells, operations, and water uses in the WVBA Site, and to protect RID wells that are not currently impacted. The Work Plan was prepared in accordance with the provisions specified in Arizona Administrative Code (A.A.C.) R18-16-405. The proposed ERA is also consistent with the goals established for the federal Superfund program under the federal National Contingency Plan (NCP)[1].

A **Groundwater Response Action Implementation Plan** (Implementation Plan) for the WVBA Site was prepared by Montgomery & Associates under the direction of RID's legal counsel Gallagher & Kennedy, P.A. (Montgomery & Associates, 2009). The Implementation Plan was submitted to the Arizona Department of Environmental Quality (ADEQ) in September 2009. The Implementation Plan summarizes the development of

[1] See 40 CFR, Chapter 1, §300.430

preliminary **remedial objectives (ROs)**, proposes a **reference remedy** for the WVBA Site, and outlines a **streamlined approach** to complete the administrative process and implementation of the final groundwater remedy for the WVBA Site. Based on the preliminary development of ROs and analysis of the reference remedy using criteria specified in provision E of A.A.C. R18-16-407, the reference remedy is believed to be the **preferred remedial alternative** for the WVBA Site.

The preferred remedial alternative is designated as the **RID Groundwater Response Action (GRA).** The RID GRA is considered the preferred remedial alternative because it uses existing RID wells, pipelines and easements as the basis for a regional groundwater "pump and treat" system that represents the most logical, efficient, and economical remedy for the widespread groundwater contamination in the WVBA Site. The RID GRA would also provide hydraulic control and treat impacted groundwater that has migrated into the WVBA Site from two adjacent regional contamination sites including the West Central Phoenix WQARF Site (WCP Site) and the Motorola 52nd Street Superfund Site (52nd Street Site). The proposed RID GRA would be implemented in two phases, with the proposed ERA representing Phase 1.

Figure 1 depicts the boundaries of, relevant features within, and the composite extent of groundwater contamination in the WVBA Site. Groundwater within the WVBA Site is impacted by organic and inorganic compounds as a result of historical releases from numerous industrial facilities. These facilities are located in the WVBA Site, the 52nd Street Site, and the WCP Site (**Figure 2**). The primary contaminants of concern (COCs) in groundwater in the WVBA Site are volatile organic compounds (VOCs). The primary VOCs of concern are tetrachloroethene (PCE), trichloroethene (TCE), and 1,1-dichloroethene (1,1-DCE) because these compounds are detected in groundwater at concentrations exceeding the Arizona Aquifer Water Quality Standards[2]. Chromium is also considered a

[2] Other hazardous substances detected in groundwater in the WVBA Site, WCP Site, and Motorola 52nd Street Site include benzene, toluene, ethylbenzene, xylenes, nitrate, vinyl chloride, 1,1,1-trichloroethane, 1,1-dichloroethane, cis-1,2-dichloroethene, and chloroform.

COC in the WVBA Site. Methyl tertiary butyl ether (MTBE) is also detected in groundwater in the WVBA Site.

RID currently has approximately 134,000 acre-feet per year (AFY) of groundwater pumping capacity in the WVBA Site from 32 wells (31 operational; RID-111 is currently inoperable). Groundwater pumped by RID is conveyed to its service area west of the Agua Fria River (**Figure 2**). The groundwater contamination in the WVBA Site has impacted or threatens to impact all of the RID production wells located within the Site boundary. In 2008, 18 RID wells were impacted by the groundwater contamination in the WVBA Site. These impacted wells have a pumping capacity of approximately 71,000 AFY. The ERA is designed to begin mitigation of impacts to RID wells, its operations, and its water uses; to protect RID wells currently not impacted; and, ultimately, to provide RID with unrestricted use of its water supply for all beneficial uses.

This ERA Work Plan has been subdivided into the following sections:

- Early Response Action Rationale
- Summary of Site Conditions
- Early Response Action Scope of Work
- References Cited

EARLY RESPONSE ACTION RATIONALE

This section summarizes the rationale for the ERA in accordance with Subsection C of A.A.C. R18-16-405. In particular, this section explains how the ERA will attain the applicable remedy goals specified in the administrative code and be consistent with the Arizona Revised Statutes (A.R.S.) §49-282.06(A), and identifies the information used to develop the ERA.

ATTAINMENT OF ADMINISTRATIVE CODE GOALS

Subsection A of A.A.C. R18-16-405 specifies the following goals for ERAs:

- Goal A1: Address current risk to public health, welfare, and the environment;
- Goal A2: Protect or provide a supply of water;
- Goal A3: Address sources of contamination; and
- Goal A4: Control or contain contamination where such actions are expected to reduce the scope or cost of the remedy needed at the site.

The proposed ERA will achieve goals A1, A2, and A4. The proposed ERA is not designed to address sources of contamination (Goal A3) because source control is the responsibility of facility owners whose releases have impacted or threaten to impact groundwater.

Goal A1: Address current risk to public health, welfare, and the environment

The ERA will accomplish this goal by initiating remediation of the widespread groundwater contamination in the WVBA Site. Specifically, the ERA will extract impacted

groundwater, treat it to remove COCs, and discharge the treated water for a variety of beneficial uses. In addition, the ERA will include improvements to selected RID wells and conversion of open sections of RID canal to below-grade pipeline in order to reduce volatilization of VOCs into the air. Over time, the ERA, combined with supplemental response actions developed during the feasibility study, will diminish potential public exposure pathways to the groundwater contamination by reducing the concentration, toxicity, mass/volume, and mobility of COCs in the groundwater and their potential release to the environment.

Goal A2: Protect or provide a supply of water

The ERA will protect against further degradation of groundwater and impact to clean RID wells by maintaining and enhancing hydraulic containment of the contaminated groundwater. Enhanced hydraulic containment will result from continuous operation of selected RID wells instead of their current seasonal operation. The ERA will provide unrestricted use of the treated water to RID for a variety of beneficial uses.

Goal A4: Control or contain contamination where such actions are expected to reduce the scope or cost of the remedy needed at the site

The ERA will hydraulically contain the migration of COCs in the groundwater through the continuous operation of a regional pump and treat system that primarily uses existing wells and conveyances owned by RID. Use of existing RID wells and conveyances will reduce the overall cost of the final groundwater remedy. Initiation of the pump and treat system as an ERA will accelerate final remedy implementation and provide data on capture effectiveness and rate of COC mass removal that could be used to design an optimized and economical final groundwater remedy for the WVBA Site.

CONSISTENCY WITH STATUTE

For the reasons previously specified, the ERA is also consistent with the following remedial action criteria set forth in A.R.S. § 49-282-06(A):

1. Assure the protection of public health and welfare and the environment;
2. To the extent practicable, provide for the control, management or cleanup of the hazardous substances in order to allow the maximum beneficial use of the waters of the state; and
3. Be reasonable, necessary, cost-effective and technically feasible.

This ERA is consistent with remedial action criteria 1 for the reasons cited under Goal A1. The ERA will reduce the risk to public health and the environment through reductions in the concentration, toxicity, mobility, mass/volume of COCs in groundwater and through reduction of potential public exposure to VOCs volatilized into air.

The ERA is consistent with remedial action criteria 2 for the reasons cited under Goal A2. The ERA will enhance hydraulic control and initiate removal and treatment of COCs from the groundwater, which are required to protect and restore the groundwater resources in the WVBA Site for all beneficial uses.

The ERA is consistent with remedial action criteria 3 for the reasons cited under Goal A4. The ERA is reasonable in that it represents the first phase of the regional groundwater remedy required for the WVBA Site; it is necessary to restore the groundwater quality and to mitigate impact to RID's operation; it is cost-effective because it largely uses existing RID wells and conveyances; and, it is technically feasible because it uses effective remedial technologies and the necessary professional expertise is available locally to design, construct, and operate the remedy.

INFORMATION USED TO DEVELOP EARLY RESPONSE ACTION

The ERA was developed from extensive geologic, hydrogeologic, and engineering experience in accordance with the associated standards of practice for each of these disciplines. The available data on the hydrogeologic conditions and nature and extent of contamination in the WVBA Site were reviewed during development of the ERA. Montgomery & Associates is the lead technical consultant on the ERA. The Montgomery & Associates project team has broad-based experience in contaminated groundwater assessments, hydrogeologic characterization, and remediation engineering at sites similar to the WVBA Site, and the key team members are registered professional geologists or engineers in Arizona.

The ERA was developed based on the following specific information: 1) the Draft Remedial Investigation (RI) Report for the WVBA Site (Terranext, 2008a), 2) the Land and Water Use Report (Terranext, 2007), 3) Article 4 of Title 18, Chapter 16 of the A.A.C. that addresses remedy evaluation and selection, 4) the goals of the federal NCP and associated applicable federal guidance documents on conducting feasibility studies and presumptive groundwater remediation technologies developed by the United States Environmental Protection Agency (EPA) for the federal Superfund Program (EPA, 1988 and 1996), and 5) information provided by RID on their wells, conveyances, and irrigation operation.

SUMMARY OF SITE CONDITIONS

Extensive regional groundwater contamination exists in the City of Phoenix (COP) from approximately 52nd Street to 75th Avenue between Lower Buckeye Road and Campbell Avenue (**Figure 2**). The groundwater in this area is impacted primarily by VOCs resulting from historical and current releases and threatened releases to the subsurface from numerous industrial facilities. Impacted groundwater east of 7th Avenue within the 52nd Street Site is being managed by the EPA under the federal Superfund. The 52nd Street Site is subdivided into three operable units (OUs) (**Figure 2**).

Interim groundwater pump and treat systems are currently operating in OU1 and OU2 to address impacted groundwater within these OUs. To date, an OU-wide groundwater remedy has not been implemented in OU3; therefore, impacted groundwater continues to migrate from OU3 to the WVBA Site. Numerous potentially responsible parties (PRPs) have been identified in OU1, OU2, and OU3 where historical and current releases, threatened releases, and documented subsurface contamination are suspected to represent past and ongoing sources of groundwater contamination in the 52nd Street Site operable units and downgradient in the WVBA Site (ADEQ, 2008a).

The impacted groundwater that exists north of McDowell Road between 27th and 51st Avenues is associated with the WCP Site and is being managed by ADEQ. The WCP Site is subdivided into 5 operable units: 1) East Grand Avenue, 2) West Grand Avenue, 3) North Plume, 4) North Canal Plume, and 5) West Osborn Complex. Impacted groundwater in the West Osborn Complex exists immediately north and nominally upgradient of the WVBA Site. Numerous PRPs have been identified in the WCP Site where historical and current releases, threatened releases, and documented subsurface contamination are suspected to represent past and ongoing sources of groundwater contamination in the WCP Site and

downgradient in the WVBA Site (ADEQ, 2008c)[3]. To date, a regional remedy to mitigate the impacted groundwater in the WCP Site has not been implemented.

The WVBA Site is located immediately west of the 52nd Street Site and south of the WCP Site (**Figure 2**). The groundwater contaminant plume that extends from the Motorola 52nd Street facility to 75th Avenue is one of the largest plumes in the United States.

WEST VAN BUREN SITE AREA

The WVBA Site was informally established in 1987 and then formally registered as a WQARF site in 1998 (ADEQ, 2008b). The WVBA Site is approximately 8 miles long and 1.5 miles wide. The site comprises approximately 12 square miles within the western portion of the COP. The extent of groundwater contamination associated with the WVBA Site is generally bounded on the north by Interstate 10, on the east by 7th Avenue, on the south by Lower Buckeye Road, and on the west by 75th Avenue. The City of Tolleson is located immediately west of the WVBA Site.

The Draft RI Report was published by ADEQ in October 2008 (Terranext, 2008a). The Draft RI Report included summaries of the following information:

- Methodologies and scope of groundwater investigations conducted in the WVBA Site from 1987 through 2008.
- Results of approximately 50 facility-specific soil and/or groundwater investigations, and remedial actions at some sites, conducted by PRPs at suspected source areas within the WVBA Site.
- Surface water, geologic, hydrogeologic, and ecologic conditions;

[3] ADEQ reported at its January 18, 2008 WQARF Board meeting that the West Osborn Complex is currently in the FS stage and that impacted groundwater from this operable unit was more extensive than originally thought and probably has merged with the WVBA Site. Also, the results of the draft RI for the WVBA Site indicated that volatile organic compounds appear to be migrating from the WCP Site to the WVBA Site (Terranext, 2008a).

- Nature and extent of contamination;
- Impacts to RID's wells and fate and transport of COCs in their conveyance system; and
- COC fate and transport in groundwater.

The public comment period for the Draft RI Report ended on December 31, 2008. ADEQ is currently in the process of responding to comments on the Draft RI Report, and developing and soliciting input from the community on ROs. Based on a recent meeting with ADEQ, ADEQ plans to finalize the RI report by the end of 2009. However, recent budget constraints may delay this process.

A summary of the physical setting, hydrogeologic conditions, groundwater conditions, sources of contamination, and impact on RID wells and operations are provided in the following sections based on the results of the RI.

PHYSICAL SETTING

The relevant aspects of the physical setting in the WVBA Site include current and future land uses and surface water conditions.

Land Uses

The WVBA Site is located in the western portion of the COP. The area within the WVBA Site is largely urbanized. The urban density is currently highest in the east near the city center and lowest in the west where substantial active and retired agricultural lands exist. New industrial complexes are being developed in the western portion of the WVBA Site. The primary current land uses in the WVBA Site identified in the Land and Water Use Report include agricultural/vacant, industrial, warehouse, transportation, residential, and

mixed commercial/public (Terranext, 2007). The population in the WVBA Site is expected to increase in the future with the largest increases occurring in the west; therefore, residential land use is expected to increase proportionately compared to the other land uses. The land uses reported by the respondents to the land use questionnaires, who were largely industrial in nature, are not expected to change significantly in the future.

Surface Water

The Salt River is located south of the WVBA Site. Localized flow occurs in the Salt River south of the WVBA Site as a result of treated wastewater releases from the COP's 23rd Avenue Waste Water Treatment Plant (WWTP). More extensive flow in the Salt River in the area south of the WVBA Site can occur periodically as a result of runoff from heavy precipitation events and releases from upstream reservoirs on the Salt and Verde River systems. A portion of this flow in the Salt River recharges the groundwater in the area south of the WVBA Site. This recharge can affect groundwater levels, hydraulic gradients, and groundwater flow directions in the WVBA Site.

RID operates its primary canal, designated as the "RID Main Canal", in the southern portion of the WVBA Site to convey irrigation water to its service area west of the Agua Fria River (**Figure 2**). The RID Main Canal extends from approximately 19th Avenue and Interstate 17, through the cities of Phoenix, Tolleson, Avondale and Goodyear to its terminus west of Buckeye (approximately 32 miles west of the WVBA Site). The RID Main Canal conveys a mixture of treated wastewater from the COP 23rd Avenue WWTP and groundwater pumped from the WVBA Site and adjacent areas to the agricultural land in Goodyear and Buckeye. The RID Main Canal receives a nominally continuous flow of approximately 25,000 to 30,000 AFY of treated wastewater, approximately 37,000 AFY of impacted groundwater from RID wells within the WVBA Site, and approximately 38,000 AFY of groundwater from RID wells within the WVBA Site that are currently not

impacted by the groundwater contamination. The majority of this groundwater pumping occurs during the peak irrigation demand season that extends from March to September.

Approximately 15,000 of the 37,000 AFY of the impacted groundwater conveyed to the RID Main Canal are pumped from RID wells along Van Buren Street during the peak irrigation season. This impacted groundwater is conveyed to the RID Main Canal in the RID "Salt Canal" (**Figure 1**). The Salt Canal extends from approximately Interstate 17 to 83rd Avenue. The Salt Canal is predominantly a below-grade pipe with a few short sections of open canal that exist adjacent to Van Buren Street. Flow from the Salt Canal discharges to the RID Main Canal near 83rd Avenue between Van Buren Street and Washington Street. RID also operates several smaller pipelines and open canals within the WVBA Site to convey groundwater from RID wells to the RID Main Canal.

The Salt River Project (SRP) also operates water conveyances in the WVBA Site. North-south oriented lateral canals transport water from SRP's Grand Canal southward, under gravity flow, for irrigation use in the WVBA Site and surrounding area. The lateral canals are also supplied by a number of SRP production wells located in areas surrounding the WVBA Site. SRP does not operate wells within the WVBA Site.

HYDROGEOLOGIC CONDITIONS

The WVBA Site is located within the West Salt River Valley (SRV). The SRV is an alluvial basin consisting of unconsolidated to semi-consolidated sediments typical of Basin and Range physiography. These sediments are up to several thousand feet thick in the center of the basin and range in size from clay to cobbles, with some evaporite deposits (Terranext, 2008a). In general, the SRV is subdivided into three hydrogeologic units from shallowest to deepest: 1) Upper Alluvial Unit (UAU), 2) Middle Alluvial Unit (MAU), and 3) Lower Alluvial Unit (LAU) (**Figure 3**). The units of primary interest in the WVBA Site are the

UAU and MAU. It is reported in the Draft RI Report that the LAU does not currently appear to be impacted in the WVBA Site, although limited data exist to characterize the LAU (Terranext, 2008a). The LAU is not discussed in detail in this report.

An analysis of lithologic logs from approximately 200 monitor wells and other types of wells was conducted by ADEQ for the WVBA Site during the RI (Terranext, 2008a). Based on this analysis, the UAU within the WVBA Site was further divided into two subunits designated as the UAU1 and UAU2. The UAU1 is generally composed of loose surface soil grading downward into interfingered sand, gravel, and thin clayey sand lenses. The UAU1 ranges in thickness from approximately 170 to 310 feet. In general, the UAU1 exhibits higher percentages of fine-grained sediments west of 75th Avenue and in the northern portion of the WVBA Site.

The UAU2 is generally composed of fine grained sediments with large percentages of clay. The top of the UAU2 is encountered at depths ranging from approximately 170 to 310 feet below land surface (bls). The UAU2 ranges in thickness from approximately 30 to 260 feet, with the thickest portion existing in the western portion of the WVBA Site. In general, the UAU2 is more fine-grained west of 67th Avenue and in the southern portion of the WVBA Site.

The MAU is identified below the UAU2 based on a lithologic sequence characterized by at least approximately 40 feet of hard brown clay or sticky brown clay. Below this sequence, the MAU is composed predominantly of fine-grained sediments. The MAU is encountered at depths ranging from approximately 260 to 500 feet bls. The total thickness of the MAU was not reported in the Draft RI Report.

The LAU consists mainly of conglomerate and gravel grading into finer-grained mudstones toward the center of the basin. The LAU reaches thicknesses of up to 10,000 feet in the center of the basin. There are no monitor wells completed in the LAU and only two

RID production wells are completed in the upper portion of the LAU. Consequently, there is little information regarding the LAU hydrogeologic conditions at the WVBA Site.

GROUNDWATER CONDITIONS

Groundwater conditions in the WVBA Site have been monitored periodically since 1993 as part of the RI. Groundwater within the WVBA Site generally occurs under unconfined conditions in the UAU and under semi-confined to confined conditions in the MAU. Groundwater levels in the UAU have declined approximately 35 feet in the monitor wells within the WVBA Site based on groundwater monitoring conducted during the RI from 1993 to the present. The rate of groundwater level decline was estimated to be approximately 3 feet per year and corresponds to drier than normal precipitation conditions that have prevailed since 1995. On an annual basis, groundwater levels in the WVBA Site vary seasonally with the highest water levels observed in the winter and lowest water levels observed in the summer. These fluctuations are due primarily to seasonal variations in groundwater pumping from the RID wells and are most prevalent in the central and western portions of the WVBA Site.

The prevailing lateral groundwater flow direction in UAU1, UAU2, and MAU is generally to the west, although groundwater flow directions can vary locally and seasonally due to recharge and groundwater pumping from the RID wells. The largest deviations from the prevailing westerly groundwater flow direction are observed in the central and western portions of the WVBA Site in close proximity to the RID wells. In general, a downward vertical gradient exists over large portions of the WVBA Site, which causes a downward component of groundwater flow over most of the WVBA Site.

Based on the average horizontal hydraulic gradient and range of estimated hydraulic conductivities reported in the draft RI report for the UAU1, and assuming an effective

porosity of 0.3, the average horizontal groundwater velocities in the largely coarse-grained UAU1 are estimated to range from 15 to over 2,000 feet per year (ft/yr). The average groundwater velocities in the fine grained UAU2 and MAU are estimated to be less than 100 ft/yr.

Recharge in the WVBA Site occurs from infiltration of excess irrigation water from agricultural land, leakage from irrigation canals, and infiltration of treated wastewater and surface water runoff in the Salt River.

Groundwater pumping by RID represents the primary discharge from the WVBA Site (Terranext, 2008a). RID currently operates approximately 50 large capacity wells east of the Agua Fria River. Thirty-two of these wells are located within the WVBA Site. The RID wells located within the WVBA Site are variably screened in the UAU, MAU and LAU. On average, RID pumps approximately 75,000 AFY of groundwater from wells located in the WVBA Site. Based on the reported hydrogeologic conditions in the WVBA Site in the Draft RI Report, the RID wells probably derive most of their water from the UAU. While groundwater levels declined approximately 35 feet in the last 16 years, coinciding with onset of drought conditions in the mid 1990s, significant mining of groundwater has not occurred in the WVBA Site as a result of the long-term RID pumping. Other potential and current groundwater users in or near the WVBA Site include Salt River Project, COP, and the City of Tolleson (Terranext, 2007).

NATURE AND EXTENT OF GROUNDWATER CONTAMINATION

Groundwater contamination in the WVBA Site was first discovered in 1984 during routine groundwater sampling at the Phoenix Fuel Terminal (PFT; also known as the Van Buren Tank Farm) (Terranext, 2008a). Since that time, a substantial effort has been undertaken to characterize the nature and extent of groundwater contamination, as well as

identify potential contamination sources. Based on the RI and other supplemental characterization work, the primary COCs detected at concentrations above regulatory standards in the groundwater within the WVBA Site are VOCs. Specifically, the primary VOCs detected are PCE, TCE, and 1,1-dichloroethene[4]. To a lesser extent, chromium is also considered a COC. MTBE has also been detected in the WVBA Site groundwater in the vicinity of the PFT (Terranext, 2008b).

The Draft RI Report includes a detailed narrative, as well as tabular and graphical summaries of the areal extent and temporal changes in COC concentrations in the UAU1, UAU2, and MAU over the period 1993 to 2008. PCE and TCE concentrations as high as 95,000 micrograms per liter (µg/L) and 1,800 µg/L, respectively, have been reported in the UAU1 (Terranext, 2008a). As reported in the Draft RI Report, the LAU does not appear to be impacted in the WVBA Site, although limited data are available to characterize the LAU water quality (Terranext, 2008a).

Figures 4 through 6 depict the extent and spatial variation in total VOC concentrations in the UAU1, UAU2, and MAU, respectively. These maps were prepared based on first quarter 2008 water quality data included in the Draft RI Report. As depicted on the figures, the most extensive groundwater contamination exists in the UAU1 and UAU2, with a substantially smaller area of impact existing in the MAU. The RID wells are primarily screened in the UAU and MAU and probably derive most of their water from the UAU. The water quality depicted on **Figures 4 and 5** indicate elevated total VOC concentrations in the north-central and eastern portion of the WVBA Site, which indicate that VOC-impacted groundwater is currently migrating into the WVBA Site from the WCP and 52nd Street Sites. These observations are consistent with information reported in the Draft RI Report published by ADEQ. Specifically, ADEQ reported that water quality data developed during the RI indicated that VOCs were migrating from the 52nd Street and WCP Sites to the WVBA Site.

[4] Other hazardous substances detected in groundwater in the WVBA Site, WCP Site, and Motorola 52nd Street Site include benzene, toluene, ethylbenzene, xylenes, nitrate, vinyl chloride, 1,1,1-trichloroethane, cis-1,2-dichloroethene, 1,1-dichloroethane, and chloroform.

SOURCES OF CONTAMINATION

A substantial effort was undertaken by ADEQ during the RI to identify PRPs that have contributed to the groundwater contamination within the WVBA Site (Terranext, 2008a). Over 60 PRPs have been identified in the WVBA Site based on information included in the Draft RI Report and other available records. Vadose zone investigations were conducted at approximately 50 of these PRP facilities; groundwater investigations were conducted at 11 of these facilities (Terranext, 2008a). Over 25 PRPs have been identified in the 52nd Street Site (Terranext, 2008a; ADEQ, 2008a). Over 20 PRPs have been identified in the WCP Site (ADEQ, 2008b). The PRP searches within the 52nd Street, WCP, and WVBA Sites have not been completed and, therefore, additional PRPs may be identified in the future.

IMPACT OF GROUNDWATER CONTAMINATION ON ROOSEVELT IRRIGATION DISTRICT WELLS AND OPERATIONS

Thirty-two (31 operational; RID-111 is currently inoperable) RID production wells are located within the WVBA Site (**Figure 7**). In September 2008, 18 RID wells had detectable concentrations of COCs and 14 RID wells were impacted by COCs at concentrations exceeding Arizona Aquifer Water Quality Standards (AWQSs) (Terranext, 2008b). The COCs detected above AWQSs in September 2008 included PCE, TCE, and 1,1-DCE. Of these COCs, PCE and TCE were the most prevalent and TCE was detected at the highest concentration of 85 µg/L in RID wells 92 and 114. The AWQS for both PCE and TCE is 5 µg/L. In September 2008, RID wells 107 and 108 also contained MTBE at concentrations of 20 and 45 µg/L, respectively (Terranext, 2008a and b). These two RID wells are located near the PFT. An AWQS has not been established for MTBE. Groundwater pumped from RID wells 102 and 105 in 2008 also contained total chromium at concentrations of 21 and 12 µg/L, respectively. These concentrations are less than the AWQS for total chromium of 100 µg/L.

Approximately 71,000 AFY (equivalent to approximately 44,000 gallon per minute (gpm)) of annual pumping capacity exists in the currently impacted RID wells within the WVBA Site. The impacted groundwater pumped from the RID wells, along with wastewater and groundwater pumped from unimpacted RID wells, is currently conveyed to the RID Main Canal and then to RID's service area west of the Agua Fria River. Groundwater pumping from the RID wells comprises the primary groundwater discharge from the WVBA Site (Terranext, 2008a). Historical operation of RID wells appears to have limited the downgradient migration of COC-impacted groundwater within the WVBA Site.

The COC-impacted groundwater in the WVBA Site impairs RID's wells, its operation, and unrestricted use of its water supply, and represents an ongoing liability to RID, as previously stated in RID's comment letter on the Draft RI Report submitted to ADEQ on December 23, 2008 (RID, 2008). A comprehensive groundwater response action conducted under state and federal authority in the WVBA Site is required to mitigate the impairment and eliminate the associated liability to RID.

SUMMARY OF SITE STATUS

A substantial effort was undertaken by ADEQ and other parties over the past 20 years to characterize the hydrogeologic conditions, nature and extent of groundwater contamination, and potential sources of contaminants to the groundwater in the WVBA Site. Based on that effort, the following are key findings and milestones for the WVBA Site:

- The Draft RI Report was published by ADEQ in October 2008. The Draft RI Report summarizes the regional groundwater and contaminant assessment conducted by ADEQ and other private parties at facilities through the site.

- The Land and Water Use Study has been completed. This study identified RID as the largest current groundwater user in the WVBA Site and serves as one basis for developing the ROs.
- Impacted groundwater exists over a large area and to depths greater than 300 feet bls.
- Numerous PRPs located in the WVBA, WCP, and 52nd Street Sites have contributed, are suspected to have contributed, or threaten to contribute to the groundwater contamination in the WVBA.
- The community has been routinely informed on the project status and has actively participated in the administrative process.
- RID currently operates 31 production wells in the WVBA Site and 18 of these wells are currently impacted by the groundwater contamination.
- The impairment to RID's wells, operations, and water supply constitute the primary driver for the groundwater remedy in the WVBA Site.
- The existing RID wells, conveyances, and easements are well-positioned to become the basis for an effective and economical regional groundwater remedy for the WVBA Site, as well as for COCs migrating to the WVBA Site from the 52nd Street and WCP Sites.

DESCRIPTION OF EARLY RESPONSE ACTION

The ERA comprises Phase 1 of the RID GRA (**Figure 8 and Table 1**). The ERA was developed based on an evaluation of site conditions, the preliminary development of ROs, the preliminary development and analysis of the proposed reference remedy, and the extensive experience of RID's technical consultant on similar groundwater contamination sites. The ERA includes actions and technologies that are proven, reliable, and effective. The proposed ERA would be implemented in two phases as follows (the phase designations in this Work Plan are consistent with those used in the Implementation Plan):

PHASE 1A

The objective of Phase 1A is to begin groundwater treatment in an efficient, economical and effective manner as soon as possible. To meet this objective, Phase 1A would include design and construction of a new 20,000 gpm liquid-phase GAC treatment facility to be located at the RID Operations Facility near 84th Avenue and Van Buren Street. Phase 1A would treat impacted groundwater from RID wells 105, 106, 107, 108, 109, 110, 112, 113, and 114 located along Van Buren Street and adjacent to the existing RID Salt Canal (**Figure 8**). These wells would be operated as continuously as possible depending on the demand for treated water (instead of the current seasonal operation) to maximize capture and contaminant mass removal. The impacted groundwater would be conveyed to the new treatment facility in the existing Salt Canal (with minor improvements to eliminate open sections) and a new below-grade pipeline installed from the terminus of the Salt Canal near 83rd Avenue to the new treatment facility. The treated water from Phase 1A would be used for its highest beneficial use, which could include irrigation, industrial supply, and/or potable supply. A Poor Quality Groundwater Withdrawal Permit may be obtained in coordination with the Arizona Department of Water Resources during Phase 1A.

Based on current VOC concentrations in the Phase 1A RID wells, the estimated total annual VOC mass removal during Phase 1A would be approximately 3,700 pounds (**Table 1**). Groundwater and treatment facility performance monitoring would be conducted during Phase 1A to assess wellfield capture and treatment effectiveness.

RID wells 107 and 108 have been included in Phase 1A for planning purposes. Historical and recent water quality data from these wells indicate substantial concentrations of MTBE in addition to COCs. MTBE has been used as a gasoline additive since the late 1970s. The probable source of MTBE to the groundwater in the vicinity of RID wells 107 and 108 is the PFT, which is located immediately east and upgradient of these wells. If incorporated into Phase 1A, these wells may require an additional or different treatment technology than liquid-phase GAC to remove the MTBE because MTBE is not readily removed using liquid-phase GAC (EPA, 1998). Phase 1A may include treatability studies to determine the best treatment technology for groundwater pumped from RID wells 107 and 108, or to determine whether blending and restricted use of these wells can minimize MTBE concentrations in the treated water.

PHASE 1B

The objectives of Phase 1B would be to expand wellfield capture and maximize COC mass removal by treating impacted groundwater from the RID wells that have the highest total COC concentrations. The planning, design, permitting, and property access elements of Phase 1B would begin concurrently with the initiation of Phase 1A and proceed on a parallel track. It is envisioned that these Phase 1B elements will take up to 1 year to complete. Therefore, it is expected that Phase 1B construction activities would begin approximately one year after the initiation of Phase 1A.

To meet the Phase 1B objectives, RID wells 89, 92, 95, and 100 would be incorporated into the operation and pumped on a continuous basis (**Table 1; Figure 8**). This would be accomplished by installing new below-grade pipelines from these wells to the Salt Canal. To maintain the total flow rate in the Salt Canal at approximately 20,000 gpm, extracted groundwater from RID wells 105, 109, and 110 (i.e., wells with lowest VOC concentrations along Van Buren Street) would be conveyed to the RID main canal in additional new below-grade pipelines and the RID pipelines that currently exist between RID wells 89, 92, and 95 and the RID Main Canal. After redirecting the extracted groundwater from these RID wells, they would be operated on a seasonal demand basis. However, if additional capture near the leading edge of the plume is required, RID well 95 would be pumped as continuously as possible to maximize capture.

The Phase 1B wellfield is expected to be effective at controlling the migration of the western plume leading edge, extracting groundwater with high COC concentrations from the plume, and minimizing the southerly migration of the impacted water towards the unimpacted RID wells located along the RID Main Canal. Based on current VOC concentrations in the Phase 1B wells, the estimated total annual VOC mass removal during Phase 1B would be approximately 5,700 pounds (**Table 1**). The treated water from Phase 1B would be used for its highest beneficial use, which could include irrigation, industrial supply, and/or potable supply.

EARLY RESPONSE ACTION TASKS

The following tasks comprise the ERA:

- Task 1 – Meetings
- Task 2 – Community Involvement
- Task 3 – Data Collection and Analysis
- Task 4 – Permits and Property Access
- Task 5 – Design
- Task 6 – Construction
- Task 7 – System Testing and Start-up
- Task 8 – Operation and Maintenance Plan

Brief summaries of the activities anticipated for each task are provided below.

TASK 1 – MEETINGS

Meetings will be scheduled with interested stakeholders to coordinate the ERA activities and obtain feedback and input on significant aspects of the ERA. Coordination meetings will be held with ADEQ throughout the entire ERA. So far this year, meetings with ADEQ have been held on February 6, March 23, April 8, May 18, August 19, and August 31 to develop and review plans for the RID GRA and ERA.

TASK 2 – COMMUNITY INVOLVEMENT

Community involvement during the ERA planning and implementation will be facilitated in accordance with A.A.C. R18-16-404 and the existing Community Involvement Plan (CIP) developed by ADEQ for the WVBA Site. ADEQ provided a copy of the CIP, and RID's technical team has reviewed it. Periodic public meetings would be held to communicate progress on the ERA and obtain feedback from the community.

TASK 3 – DATA COLLECTION AND ANALYSIS

Additional groundwater quality data will be obtained during the ERA to the extent required for ERA design and implementation. Groundwater samples were collected and analyzed for VOCs and chromium from 24 RID wells in September 2008 (Terranext, 2008b). These data have been reviewed, and a supplementary sampling program may be developed to fill data gaps if needed. The supplementary sampling program may include sampling from selected RID wells, ADEQ monitor wells, and RID canals. All samples will be analyzed for COCs. All water quality analytical work will be conducted at an Arizona-certified laboratory. To the extent possible, the sampling methods will adhere to protocols developed by ADEQ for the WVBA Site.

Groundwater levels in the WBVA Site will be measured to the extent required for ERA design and implementation. If approved by ADEQ, pressure transducers may be installed in selected WVBA Site monitor wells to monitor water levels. In addition, manual groundwater levels may be measured with an electronic sounder to supplement the transducer measurements. The water level data will be used to support groundwater modeling efforts conducted by RID during the ERA.

TASK 4 – PERMITS AND PROPERTY ACCESS

A substantial portion of the construction work associated with the proposed ERA will take place in existing RID easements. However, it is anticipated that some new permits, property access agreements, and/or easements will be required to construct the ERA components, which will include converting the open sections of the Salt Canal to below-grade pipeline, installing new below-grade pipelines, constructing the treatment facility, improving well sites, and constructing the treated water distribution pipeline.

Preliminary contact has been made with the COP to discuss the ERA project and to assess the level of coordination required for its implementation.

TASK 5 – DESIGN

Engineering design will be conducted for several distinct components of the ERA. These include modifications to certain RID wells, improvements to wellhead configurations, improvements to various reaches of the Salt Canal, design of the central groundwater treatment facility, and design of the treated water distribution pipeline. To the extent required under A.A.C. R18-16-411, all designs will be submitted to ADEQ for approval.

Well Modifications and Wellhead Improvements

Modification to two deep RID wells, improvements to selected wells to enhance structural integrity, and improvements to wellhead configurations at impacted wells will be evaluated and conducted to the extent required to optimize remedy operations. Specifically, these activities will be designed to prevent potential downward migration of impacted groundwater from the UAU to deeper groundwater zones, to minimize point source

volatilization of VOCs from the pump discharge, to enhance long term operability of the existing RID wells, to enable remote well operation, and to enhance security at selected well sites.

Well Modifications

Impacted RID wells 89 and 95 are deep wells with screened intervals in the UAU, MAU and the LAU. The remaining impacted RID wells are completed in the UAU only (12 wells) or in the UAU and MAU (8 wells). RID wells 89 and 95 represent potential conduits for flow of the contaminated groundwater from the UAU to the underlying groundwater zones when not operating.

An evaluation and sampling program will be developed to assess the potential for downward migration of impacted water in RID wells 89 and 95 and to minimize the extraction of deep clean groundwater. This program may include video logging, vertical flowmeter logging (e.g., spinner flowmeter), and depth-specific groundwater sampling and analysis in both wells. Groundwater sampling may be performed using traditional purging methods and/or passive methods (e.g., passive diffusion bags or HydraSleeves). If the evaluation results indicate that the wells could be vertical conduits for downward migration of impacted groundwater, or that a significant portion of the flow from the wells is from the deep clean screened intervals, a well modification program will be developed. This program could include sealing the well screen completed in the deeper groundwater zones.

The RID wells proposed for use in the ERA will be evaluated to identify potential integrity issues that would adversely impact their long term use in the remedy. This evaluation would include video logging and potentially other activities to assess and improve structural integrity. If needed, casing liners would be installed in wells that appear to be structurally deficient for long term use.

Wellhead Improvements for Volatilization Control

As noted in Section 4.4 and Table 4-6 of the Draft RI Report, volatilization of VOCs occurs at the point of discharge from the impacted wells into the gravity-flow pipelines and canals (Terranext, 2008). An evaluation will be conducted to identify wells that may require volatilization controls and to identify potential measures that could mitigate the volatilization of VOCs at the wellheads. Volatilization control could involve modification to the discharge pipe to minimize spray and aeration of the VOC-impacted groundwater, and/or sealing the discharge receiver box, where present, and installing a passive carbon filter to maintain an atmospheric pressure balance. Impacted wells that discharge directly into an open canal will be modified to incorporate a receiving structure and similar volatilization controls.

Wellhead Instrumentation and Controls

As impacted RID wells are connected to the treatment system, instrumentation and controls will be added to enable remote operation, as well as monitor operational status, flow rate, and water level at the well. Remote well operation and data collection will be accomplished via telemetry to a supervisory control and data acquisition (SCADA) system and associated wellhead switchgear modifications. Security of RID wells incorporated into the ERA will be enhanced by the design and construction of suitable enclosures.

Salt Canal Improvements

The Salt Canal is predominantly a buried, 48-inch, concrete, gravity-flow pipeline that originates at RID well 114 near 23rd Avenue and Van Buren Street and terminates at the RID Main Canal at 83rd Avenue. However, several reaches of the Salt Canal remain open and represent a potential exposure pathway to VOC-impacted water and must be converted to a closed pipeline. Additionally, the Salt Canal conveyance will be extended from its current terminus to the location of the planned central groundwater treatment facility to

segregate the impacted water being conveyed for treatment and other water in the RID Main Canal. As part of this task and to the extent feasible, the entire Salt Canal pipeline will be inspected to evaluate its integrity and to determine whether other repairs are needed.

Conversion of Open Canals

Three sections of the Salt Canal are currently open along the south shoulder of Van Buren Street. Approximately 250 feet of open canal exists immediately west of 69th Avenue, approximately 320 feet of open canal exists about 800 feet west of 75th Avenue, and approximately 1,150 feet of open canal exists just west of 79th Avenue. These 3 reaches of open canal will be replaced with 48-inch concrete pipe designed and installed consistent with existing piped sections of the Salt Canal.

Extension of Salt Canal

A new 48-inch diameter pipeline (constructed of steel, high density polyethylene, or ductile iron) will be designed to extend the Salt Canal from its current terminus at 83rd Avenue to the planned central groundwater treatment facility site at 85th Avenue, just north of the RID Operations Facility. The nominal 3,200 feet pipeline extension will be constructed in existing RID easements adjacent to the RID Main Canal.

Treatment System

Based on available water quality data and preliminary discussions with ADEQ, liquid-phase granular activated carbon (GAC) is considered to be the best treatment technology for the WVBA Site. A liquid-phase GAC treatment system will be designed to remove VOCs from groundwater at a rate up to 20,000 gpm. The major system components will include a feed water diversion manifold to enable distribution of untreated groundwater to the treatment system or to the RID Main Canal, booster pump stations, recessed

containment vaults, particulate filters, GAC vessels and interconnecting piping/valving, instrumentation and control systems, perimeter security wall/fencing, and operations/administration building(s). The treatment system design will be submitted to ADEQ for approval in accordance with A.A.C. R18-16-411.

Liquid-Phase GAC Systems

Liquid-Phase GAC treatment technology was selected based on available water quality data and due to its proven and reliable operation. The VOC treatment will consist of a dual-pass through GAC vessels (i.e. Siemens HP1230 units or equivalent) in a lead-lag serial configuration. The GAC vessels will be placed in concrete containment vaults and provided with appropriate spill/leak detection, alarms and controls.

Instrumentation and Controls

Automated instrumentation and controls will be designed and installed to enable on-site and remote control of the treatment process, automated shut-down, and to provide for all necessary SCADA capabilities. The SCADA system will also communicate with all of the RID wells connected to the treatment system. Appropriate monitors and alarms will be included on all key system components.

Diversion Structure and Pump Station

A diversion structure will be designed and constructed to enable all or a portion of untreated water from the Salt Canal pipeline to be directed to the RID Main Canal or to the pump station for conveyance through the central groundwater treatment system. The diversion structure will incorporate design considerations that will minimize volatilization of VOCs. The diversion structure may also incorporate features to facilitate capture of coarse solid materials that may be discharged from the wells or entrained in the pipeline. The pump station will be designed and constructed to accommodate all of the pumping capacity for the

full ERA build-out of a nominal 20,000 gpm. This pumping station will provide the necessary head to provide driving pressure through the treatment system and into the distribution pump station. The distribution pump station will be required to complete the delivery of treated water to the west valley.

General Facility Buildings

General facility buildings will be constructed to support the operation and maintenance of the central groundwater treatment facility. The treatment facility will be enclosed by a suitable fence or wall to provide security and control access.

Treated Water Distribution Pipeline

A pressurized water distribution pipeline will be designed and constructed to allow delivery of treated water from the central groundwater treatment facility to the west valley. This below-grade pipeline will be nominally 36-inches in diameter and will be constructed in existing RID easements along the alignment of the RID Main Canal. This pipeline will cross Interstate 10 (2 places), Interstate 101 and the Agua Fria River adjacent to the existing RID Main Canal siphon. Depending on the results of detailed design and the ultimate termination of this pipeline, an additional booster pump station may be required.

TASK 6 – CONSTRUCTION

Construction will commence on each of the three discrete system elements (Salt Canal and lateral pipelines, central groundwater treatment facility, and treated water distribution pipeline) upon completion of design documents, receipt of required approvals, and acquisition of all required permits and access agreements.

TASK 7 – SYSTEM TESTING AND START-UP

Start-up and commissioning of each of the three discrete system elements will be conducted following completion of construction and prior to final acceptance of the facilities. The central groundwater treatment facility, including the interconnected RID wells, will be operated to verify proper function of all controls and alarm functions and to document conformance with all significant design specifications. The treated water distribution pipeline and lateral feeder pipelines to the Salt Canal will be pressure tested to demonstrate pipeline integrity prior to being placed in service.

During start-up operations, the treated water will be discharged to the RID Main Canal. The treated water will be sampled and analyzed in accordance with the discharge permit, if required, to verify proper system operation and to ensure compliance with water discharge quality standards.

TASK 8 – OPERATION AND MAINTENANCE PLAN

An operation and maintenance (O&M) plan will be prepared in accordance with A.A.C. R18-16-411 and approved by ADEQ before full-scale operations begin. The WVBA Site Community Advisory Board will be provided the opportunity to comment on the O&M plan before it is considered final.

The O&M plan will generally include:

- Certification by ADEQ that the elements of the O&M plan adequately protect public health against treatment system failure;
- A schedule and plan for water quality monitoring; and

- A process for the treatment system operator to promptly notify the potentially affected water providers of failure of a key treatment system component that could affect the quality of the treated water conveyed through the distribution pipeline.

Discharge of treated water to waters of the United States is not anticipated for the ERA; therefore, an Arizona Pollutant Discharge Elimination System permit will not be required. The RID Main Canal is not designated as waters of the United States.

SCHEDULE

Figure 9 outlines the proposed schedule for conducting the tasks described in the work plan. The timeframes anticipated for completing each task are approximate and based on the current site conditions and understanding.

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TABLES

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TABLE 1
SUMMARY OF PROPOSED ROOSEVELT IRRIGATION DISTRICT EARLY RESPONSE ACTION

ROOSEVELT IRRIGATION DISTRICT
EARLY RESPONSE ACTION WORK PLAN
WEST VAN BUREN AREA WATER QUALITY ASSURANCE REVOLVING FUND SITE

PHASE	WELL NAME	ESTIMATED PUMPING RATE (gallons per minute) [1]	TOTAL VOC CONCENTRATION (micrograms per liter) [2]		ESTIMATED MASS OF TOTAL VOCs REMOVED (pounds per year)[3]
1A Pump and treat impacted groundwater from RID wells located along Van Buren Street	RID-105	1,900		5	44
	RID-106	1,500		61	397
	RID-107	2,100		51	464
	RID-108	1,900		63	526
	RID-109	2,400		22	234
	RID-110	2,900		14	180
	RID-112	1,700		31	231
	RID-113	2,300		44	443
	RID-114	2,500		110	1,202
	SUBTOTAL	**19,200**	**AVG [4]**	**44**	**3,722**
1B Pump and treat impacted groundwater from RID wells with highest VOC concentrations	RID-89 [5]	2,900		51	652
	RID-92	1,200		119	624
	RID-95 [5]	1,700		80	593
	RID-100	2,100		65	599
	RID-106	1,500		61	397
	RID-107	2,100		51	464
	RID-108	1,900		63	526
	RID-112	1,700		31	231
	RID-113	2,300		44	443
	RID-114	2,500		110	1,202
	SUBTOTAL	**19,900**	**AVG [4]**	**66**	**5,732**

Footnotes:
1 - Pumping rates based on data provided by RID for 2008 and 2009.
2 - Sum of all detected VOCs; concentrations based on most recent analytical data available for each well.
3 - Total VOC removal in early years of remedy assuming all impacted wells from Phase 1A and 1B are pumped continously and all water is treated; actual mass removal may vary depending on demand for treated water.
4 - Pumping rate weighted average concentration in micrograms per liter assuming no loss due to volatilization or degradation.
5 - Pumping rates shown are 75% of reported rates; well testing and modification may be conducted to seal off lower portion of wells to optimize pumping of impacted groundwater.

Abbreviations:
RID - Roosevelt Irrigation District
VOC - Volatile organic compounds

R. 1 E. R. 2 E. R. 3 E.

T. 2 N. T. 2 N.

T. 1 N. T. 1 N.

Camelback Rd
Campbell Ave
Indian School Rd
Thomas Rd
McDowell Rd
Van Buren St
Buckeye Rd
Lower Buckeye Rd
Broadway Rd

101 10 17 51 202

Salt River Project Grand Canal

West Central Phoenix WQARF Site

Grand Ave

Motorola 52nd Street Superfund Site Operable Unit 3 Boundary

RID Main Canal

RID Salt Canal

RID-83 RID-84 RID-85 RID-86 RID-87 RID-88 RID-89 RID-90 RID-91 RID-92 RID-93 RID-94 RID-95 RID-96 RID-97 RID-98 RID-99 RID-100 RID-101 RID-102 RID-103 RID-104 RID-105 RID-106 RID-107 RID-108 RID-109 RID-110 RID-111 RID-112 RID-113 RID-114

West Van Buren Area WQARF Site

City of Phoenix 23rd Avenue WWTP

Salt River

91st Ave 83rd Ave 75th Ave 67th Ave 59th Ave 51st Ave 43rd Ave 35th Ave 27th Ave 19th Ave 7th Ave Central Ave 7th St 16th St

Sky

EXPLANATION

- Roosevelt Irrigation District Well
- Monitor Well
- Existing Canal or Pipeline
- Interstates
- Local Streets
- Estimated Extent of Impacted Groundwater in WVBA WQARF Site Based on 1st Quarter 2008 Data (Terranext, 2008a)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site

Abbreviations

WVBA - West Van Buren Area
WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District

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Feet

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

Study Area

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2009

FIGURE 1

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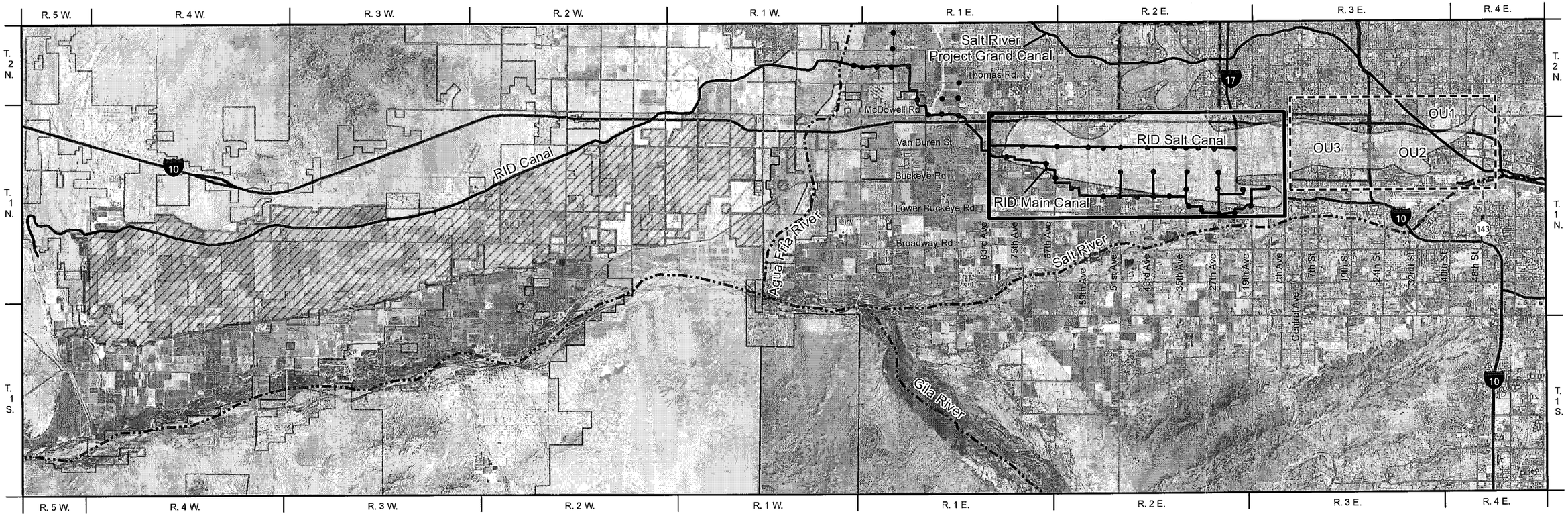

EXPLANATION

- Roosevelt Irrigation District
- City of Goodyear Boundary
- City of Avondale Boundary
- Town of Buckeye Boundary
- City of Tolleson Boundary
- Interstates
- Local Streets
- Roosevelt Irrigation District Well
- West Van Buren WQARF Site
- Motorola 52nd Street Superfund Site
- West Central Phoenix WQARF SIte
- Estimated Extent of Impacted Groundwater in WVBA WQARF Site Based on 1st Quarter 2008 Data (Terranext, 2008a)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site

Abbreviations
WQARF - Water Quality Assurance Revolving Fund
OU - Operable Unit
RID - Roosevelt Irrigation District

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0 3
Miles

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

Regional Conditions

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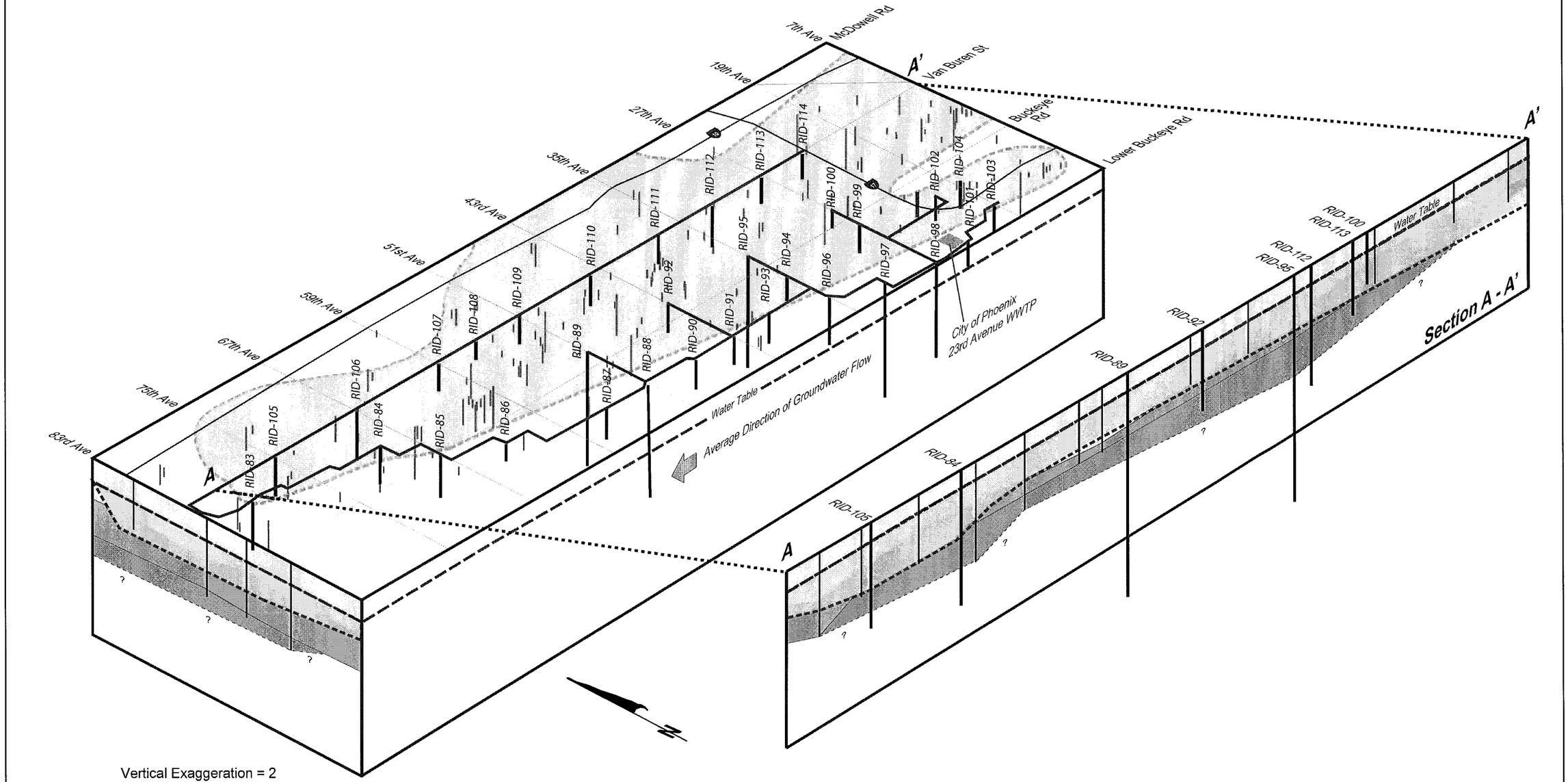
2009

FIGURE 2

G:\GIS-Tuc\Projects\802\03\Site_Map_Fig2_RegionalStudyArea_ERA.mxd\01Oct2009



EXPLANATION

- Upper Alluvial Unit 1 (UAU1)
- Upper Alluvial Unit 2 (UAU2)
- Middle Alluvial Unit (MAU)
- Estimated Extent of Impacted Groundwater In WVBA WQARF Site Based on 1st Quarter 2008 Data (Terranext, 2008a)

- Existing Canal or Pipeline
- Interstates
- Local Streets
- Roosevelt Irrigation District Well
- Monitor Well

Abbreviations
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

Conceptual Site Model

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FIGURE 3

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R. 1 E. R. 2 E. R. 3 E.

T. 2 N. T. 1 N.

Total VOC Concentrations
(based on 1st Quarter 2008 data)

- Data Not Available for Quarter
- VOCs Not Detected
- >0.5 to 1 ug/L
- 1 to 10 ug/L
- 10 to 100 ug/L
- > 100 ug/L

VOC Data from Draft RI Report (Terranext, 2008a)

Camelback Rd
Campbell Ave
Indian School Rd
Thomas Rd
McDowell Rd
Van Buren St
Buckeye Rd
Lower Buckeye Rd
Broadway Rd
Salt River Project Grand Canal
RID Main Canal
RID Salt Canal
West Central Phoenix WQARF Site
West Van Buren Area WQARF Site
Motorola 52nd Street Superfund Site Operable Unit 3 Boundary
City of Phoenix 23rd Avenue WWTP
Grand Ave
Sky Harbor
Salt River
101
17
10
202

EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 3,900 - Estimated Pumping Rate (gpm)
  - 51 - Total 2008 VOC Concentration (ug/L)
  - (ND = Not Detected, NS = Not Sampled)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

- WQARF - Water Quality Assurance Revolving Fund
- VWWTP - Waste Water Treatment Plant
- RID - Roosevelt Irrigation District
- gpm - Gallons Per Minute
- ug/L - Micrograms Per Liter
- VOC - Volatile Organic Compound
- RI - Remedial Investigation

N

0 5,000
Feet

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

Total Volatile Organic Compounds
Upper Alluvial Unit 1
First Quarter 2008

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Water Resource Consultants

2009

FIGURE 4

G:\GIS-Tuc\Projects\802\03\Site_Map_Fig4_Total_VOC_UAU1_ERA.mxd\01Oct2009

R. 1 E. R. 2 E. R. 3 E.

T. 2 N. T. 1 N.

Camelback Rd.
Indian School Rd
Thomas Rd
McDowell Rd
Van Buren St
Buckeye Rd
Lower Buckeye Rd
Broadway Rd

Campbell Ave.
Salt River Project Grand Canal
West Central Phoenix WQARF Site
Grand Ave
Motorola 52nd Street Superfund Site Operable Unit 3 Boundary
RID Main Canal
RID Salt Canal
West Van Buren Area WQARF Site
City of Phoenix 23rd Avenue WWTP
Salt River
Sky

101 10 17 202

91st Ave 83rd Ave 75th Ave 67th Ave 59th Ave 51st Ave 43rd Ave 35th Ave 27th Ave 19th Ave 7th Ave Central Ave 7th St 16th St

AVB129-02 ND
AVB91-02 7.6
AVB96-02 2.9
RID-105 1,900 5
RID-107 2,100 51
RID-108 1,900 63
RID-109 2,400 22
RID-110 2,900 14
RID-111 Inoperable
RID-112 1,700 31
RID-113 2,300 44
AVB131-01 1
AVB124-01 135.2
AVB124-02 ND
RID-114 2,500 110
AVB132-01 80.8
AVB132-02 0.9
AVB116-02 125.2
AVB77-02 ND
AVB106-03 ND
AVB98-01 1.6
RID-106 1,500 61
RID-84 2,400 12
AVB10-02 13.3
RID-83 2,300 NS
AVB81-01 ND
DIMW-2 34.1
DIMW-1 10.8
DIMW-3 1.3
PTG-28 3.7
AVB122-03 1.6
PTG-1B 6.1
AVB126-01 5.3
AVB134-02 143.4
AVB120-02 197.9
RID-85 2,600 ND
RID-86 3,600 ND
RID-89 3,900 51
PW-1
RID-92 1,200 119
RID-95 2,300 80
RID-100 2,100 65
AVB126-02 34
RID-102 3,900 12
RID-104 3,600 11
AVB89-01 ND
AVB137-01 ND
RID-87 2,000 NS
AVB136-01 34.2
RID-94 3,300 3
RID-99 2,400 11
RID-88 2,000 ND
RID-90 2,500 NS
RID-91 3,200 NS
RID-93 4,000 ND
AVB121-02 ND
RID-96 3,000 NS
RID-97 3,200 ND
RID-103 2,200 2
RID-101 4,500 2
RID-98 3,800 NS
CMW-1D

Total VOC Concentrations
(based on 1st Quarter 2008 data)

- Data Not Available for Quarter
- VOCs Not Detected
- >0.5 to 1 ug/L
- 1 to 10 ug/L
- 10 to 100 ug/L
- > 100 ug/L

VOC Data from Draft RI Report (Terranext, 2008a)

EXPLANATION

- Roosevelt Irrigation District Well
- RID-89 - Well ID
- 3,900 - Estimated Pumping Rate (gpm)
- 51 - Total 2008 VOC Concentration (ug/L) (ND = Not Detected, NS = Not Sampled)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Existing Canal or Pipeline
- Interstates
- Local Streets

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
gpm - Gallons Per Minute
ug/L - Micrograms Per Liter
VOC - Volatile Organic Compound
RI - Remedial Investigation

N

0 5,000 Feet

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

Total Volatile Organic Compounds
Upper Alluvial Unit 2
First Quarter 2008

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Water Resource Consultants

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FIGURE 5

G:\GIS-Tuc\Projects\802\03\Site_Map_Fig5_Total_VOC_UAU2_ERA.mxd\01Oct2009

R. 1 E. R. 2 E. R. 3 E.

T. 2 N. T. 1 N.

Camelback Rd
Campbell Ave
Indian School Rd
Thomas Rd
McDowell Rd
Van Buren St
Buckeye Rd
Lower Buckeye Rd
Broadway Rd

Salt River Project Grand Canal
West Central Phoenix WQARF Site
West Van Buren Area WQARF Site
RID Main Canal
RID Salt Canal
City of Phoenix 23rd Avenue WWTP
Motorola 52nd Street Superfund Site Operable Unit 3 Boundary
Grand Ave
Salt River

101 10 17 202

RID-105 1,900 5
AVB82-02 5.5
RID-107 2,100 51
RID-108 1,900 63
RID-109 2,400 22
RID-110 2,900 14
RID-111 Inoperable
RID-112 1,700 31
RID-113 2,300 44
RID-114 2,500 110
AVB82-01 99.9
RID-106 1,500 61
AVB60-01 13
AVB81-01 ND
RID-83 2,300 NS
RID-84 2,400 12
RID-85 2,600 ND
RID-86 3,600 ND
DMW-5D ND
DMW-4D ND
DMW-2 34.1
DMW-1 10.8
DMW-3 1.3
PTC-2B 3.7
RID-89 3,900 51
PW-1
RID-87 2,000 NS
RID-88 2,000 ND
RID-90 2,500 NS
RID-91 3,200 NS
RID-92 1,200 119
RID-93 4,000 ND
RID-94 3,300 3
RID-95 2,300 80
RID-96 3,000 NS
RID-97 3,200 ND
RID-98 3,800 NS
RID-99 2,400 10.6
RID-100 2,100 65
AVB126-03 ND
RID-101 4,500 2
RID-102 3,900 12
RID-103 2,200 2
AVB69-01 ND
RID-104 3,600 11
AVB68-04 ND

91st Ave 83rd Ave 75th Ave 67th Ave 59th Ave 51st Ave 43rd Ave 35th Ave 27th Ave 19th Ave 7th Ave Central Ave 7th St 16th St

Total VOC Concentrations
(based on 1st Quarter 2008 data)

- Data Not Available for Quarter
- VOCs Not Detected
- >0.5 to 1 ug/L
- 1 to 10 ug/L
- 10 to 100 ug/L
- > 100 ug/L

VOC Data from Draft RI Report (Terranext, 2008a)

EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 3,900 - Estimated Pumping Rate (gpm)
  - 51 - Total 2008 VOC Concentration (ug/L)
  - (ND = Not Detected, NS = Not Sampled)
- Existing Canal or Pipeline
- Interstates
- Local Streets
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
gpm - Gallons Per Minute
ug/L - Micrograms Per Liter
VOC - Volatile Organic Compound
RI - Remedial Investigation

N

0 5,000 Feet

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

Total Volatile Organic Compounds Middle Alluvial Unit First Quarter 2008

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FIGURE 6

G:\GIS-Tuc\Projects\802\03\Site_Map_Fig6_Total_VOC_MAU_ERA.mxd\01Oct2009

R. 1 E. R. 2 E. R. 3 E.

T. 2 N. T. 2 N.

T. 1 N. T. 1 N.

Camelback Rd.
Campbell Ave.
Indian School Rd
Thomas Rd
McDowell Rd
Van Buren St
Buckeye Rd
Lower Buckeye Rd
Broadway Rd

101 10 17 51 202

Salt River Project Grand Canal
West Central Phoenix WQARF Site
Grand Ave
Motorola 52nd Street Superfund Site Operable Unit 3 Boundary
RID Main Canal
RID Salt Canal
West Van Buren Area WQARF Site
City of Phoenix 23rd Avenue WWTP
Salt River
Sky

Wells Contained MTBE in 2008
RID-107 = 20 ug/L
RID-108 = 45 ug/L

RID-105 1,900 5
RID-106 1,500 61
RID-107 2,100 51
RID-108 1,900 63
RID-109 2,400 22
RID-110 2,900 14
RID-111 Inoperable
RID-112 1,700 31
RID-113 2,300 44
RID-114 2,500 110
RID-83 2,300 NS
RID-84 2,400 12
RID-85 2,600 ND
RID-86 3,600 ND
RID-87 2,000 NS
RID-88 2,000 ND
RID-89 3,900 51
RID-90 2,500 NS
RID-91 3,200 NS
RID-92 1,200 119
RID-93 4,000 ND
RID-94 3,300 3
RID-95 2,300 80
RID-96 3,000 NS
RID-97 3,200 ND
RID-98 3,800 NS
RID-99 2,400 11
RID-100 2,100 65
RID-101 4,500 2
RID-102 3,900 12
RID-103 2,200 2
RID-104 3,600 11

91st Ave 83rd Ave 75th Ave 67th Ave 59th Ave 51st Ave 43rd Ave 35th Ave 27th Ave 19th Ave 7th Ave Central Ave 7th St 16th St

EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 3,900 - Estimated Pumping Rate (gpm)
  - 51 - Total 2008 VOC Concentration (ug/L) (ND = Not Detected, NS = Not Sampled)
- Existing Canal or Pipeline
- Interstates
- Local Streets
- Estimated Extent of Impacted Groundwater in WVBA WQARF Site Based on 1st Quarter 2008 Data (Terranext, 2008a)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Monitor Well

Abbreviations

WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
gpm - Gallons Per Minute
ug/L - Micrograms Per Liter
MTBE - Methyl Tertiary Butyl Ether

N

0 5,000 Feet

DRAFT

Roosevelt Irrigation District
Early Response Action Wrok Plan
West Van Buren Area WQARF Site

Impact on Roosevelt Irrigation District Wells

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FIGURE 7

G:\GIS-Tuc\Projects\802\03\Site_Map_Fig7_ImpactOnRIDWells_ERA.mxd\01Oct2009

R. 1 E. R. 2 E. R. 3 E.

T. 2 N.

T. 1 N.

Camelback Rd
Campbell Ave
Indian School Rd
Thomas Rd
McDowell Rd
Van Buren St
Buckeye Rd
Lower Buckeye Rd
Broadway Rd

Salt River Project Grand Canal

West Central Phoenix WQARF Site

Grand Ave

Motorola 52nd Street Superfund Site Operable Unit 3 Boundary

RID Main Canal

Proposed Treatment Plant

RID Salt Canal

RID-105 1,900 5
RID-106 1,500 61
RID-107 2,100 51
RID-108 1,900 63
RID-109 2,400 22
RID-110 2,900 14
RID-111 Inoperable
RID-112 1,700 31
RID-113 2,300 44
RID-114 2,500 110
RID-83 2,300 NS
RID-84 2,400 12
RID-85 2,600 ND
RID-86 3,600 ND
RID-87 2,000 NS
RID-88 2,000 ND
RID-89 3,900 51
RID-90 2,500 NS
RID-91 3,200 NS
RID-92 1,200 119
RID-93 4,000 ND
RID-94 3,300 3
RID-95 2,300 80
RID-96 3,000 NS
RID-97 3,200 ND
RID-98 3,800 NS
RID-99 2,400 11
RID-100 2,100 65
RID-101 4,500 2
RID-102 3,900 12
RID-103 2,200 2
RID-104 3,600 11

West Van Buren Area WQARF Site

City of Phoenix 23rd Avenue WWTP

Salt River

Sky

91st Ave
83rd Ave
75th Ave
67th Ave
59th Ave
51st Ave
43rd Ave
35th Ave
27th Ave
19th Ave
7th Ave
Central Ave
7th St
16th St

101 10 17 51 202

EXPLANATION

- Roosevelt Irrigation District Well
  - RID-89 - Well ID
  - 3,900 - Estimated Pumping Rate (gpm)
  - 51.4 - Total 2008 VOC Concentration (ug/L)
  - (ND = Not Detected, NS = Not Sampled)
- Existing Canal or Pipeline
- Proposed New Below-Grade Pipeline
- Interstates
- Local Streets

- Estimated Extent of Impacted Groundwater in WVBA WQARF Site Based on 1st Quarter 2008 Data (Terranext, 2008a)
- Estimated Extent of Impacted Groundwater in West Central Phoenix WQARF Site
- Estimated Extent of Impacted Groundwater in Motorola 52nd Street Superfund Site
- Monitor Well

Abbreviations
- WVBA - West Van Buren Area
- WQARF - Water Quality Assurance Revolving Fund
- WWTP - Waste Water Treatment Plant
- RID - Roosevelt Irrigation District
- gpm - Gallons Per Minute
- ug/L - Micrograms Per Liter
- OU3 - Operable Unit 3

Early Response Action
(see Table 2 for a summary of phased implementation)

N

0 5,000
Feet

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Roosevelt Irrigation District
Early Response Action Work Plan
West Van Buren Area WQARF Site

Early Response Action

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FIGURE 8

G:\GIS-Tuc\Projects\802\03\Site_Map_Fig8_RID_ERA.mxd\01Oct2009

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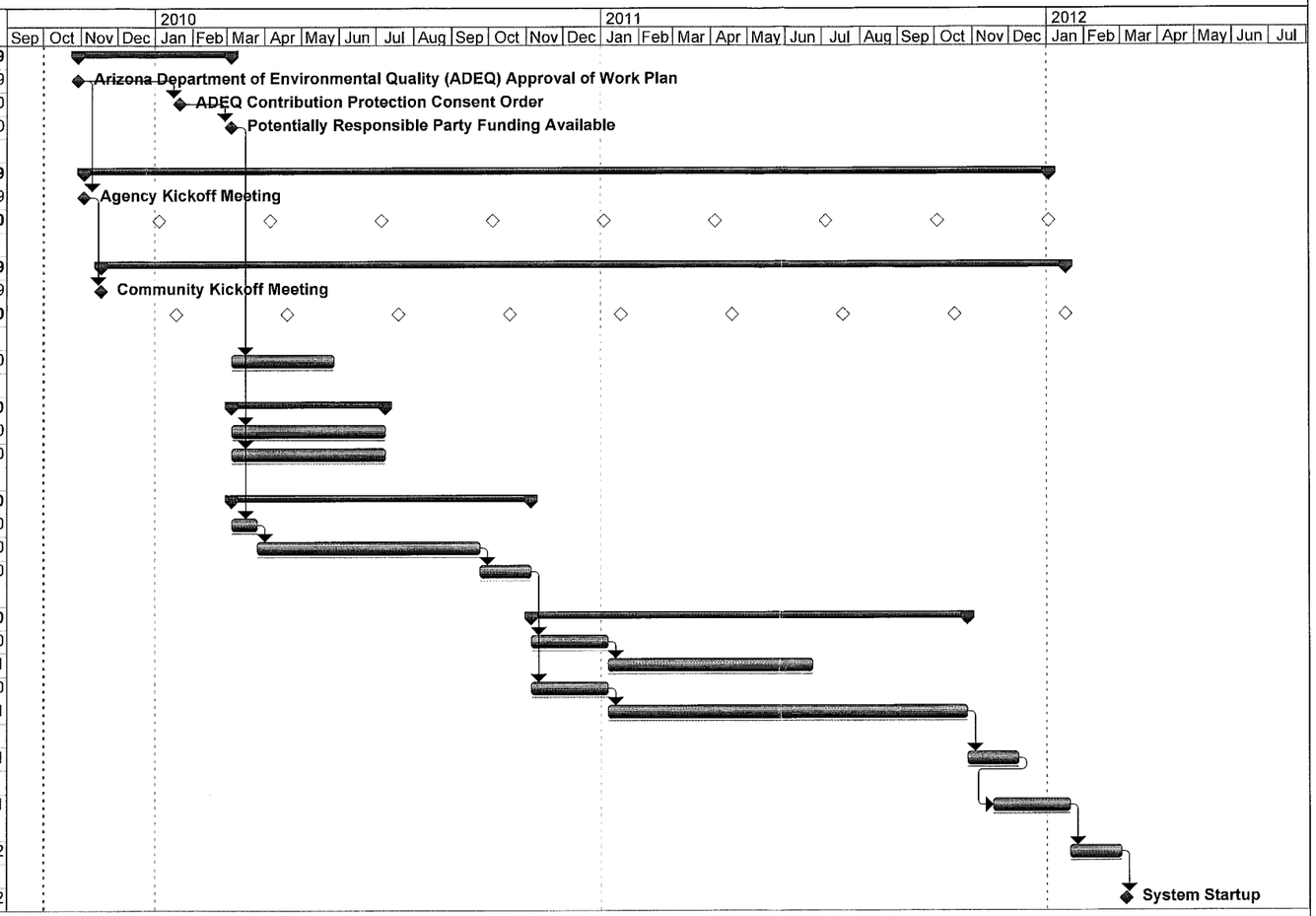
FIGURE 9. PROPOSED SCHEDULE

ROOSEVELT IRRIGATION DISTRICT EARLY RESPONSE ACTION
WEST VAN BUREN AREA WATER QUALITY ASSURANCE REVOLVING FUND SITE

ID	Task Name	Duration	Start
1	**Early Response Action Administration and Funding**	**90 days**	**Fri 10/30/09**
2	Arizona Department of Environmental Quality (ADEQ) Approval of Work Plan	0 days	Fri 10/30/09
3	ADEQ Contribution Protection Consent Order	0 days	Thu 1/21/10
4	Potentially Responsible Party Funding Available	0 days	Thu 3/4/10
5			
6	**Task 1 - Meetings**	**564 days**	**Tue 11/3/09**
7	Agency Kickoff Meeting	0 days	Tue 11/3/09
8	**Quarterly Agency Meeting**	**520 days**	**Tue 1/5/10**
18			
19	**Task 2 - Community Involvement**	**564 days**	**Tue 11/17/09**
20	Community Kickoff Meeting	0 days	Tue 11/17/09
21	**Quarterly Community Meeting**	**520 days**	**Tue 1/19/10**
31			
32	Task 3 - Data Collection and Analysis (if needed)	60 days	Fri 3/5/10
33			
34	**Task 4 - Permits and Property Access**	**90 days**	**Fri 3/5/10**
35	Obtain Construction Permits and Access Agreements	90 days	Fri 3/5/10
36	Obtain Poor Quality Groundwater Withdrawal Permit	90 days	Fri 3/5/10
37			
38	**Task 5 - Design (Wells, Impacted Water Conveyance, and Treatment)**	**175 days**	**Fri 3/5/10**
39	Conceptual Design	15 days	Fri 3/5/10
40	Detailed Design	130 days	Fri 3/26/10
41	Final ADEQ Design Approval	30 days	Fri 9/24/10
42			
43	**Task 6 - Construction (Wells, Impacted Water Conveyance, and Treatment)**	**255 days**	**Fri 11/5/10**
44	Procurement (Wells and Pipelines)	45 days	Fri 11/5/10
45	Construction (Wells and Pipelines)	120 days	Fri 1/7/11
46	Procurement (Treatment Facility)	45 days	Fri 11/5/10
47	Construction (Treatment Facility)	210 days	Fri 1/7/11
48			
49	Task 7 - System Startup and Testing	30 days	Fri 10/28/11
50			
51	Task 8 - Operations and Maintenance Manual	45 days	Fri 11/18/11
52			
53	Final ADEQ Approval	30 days	Fri 1/20/12
54			
55	System Startup	0 days	Mon 3/5/12



Project: Draft ERA Schedule HL
Date: Thu 10/1/09

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

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